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AUTHOR Friedel, Janice N.; And Others
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ABSTRACT

Studies conducted by the Eastern Iowa Community College District in 1986 revealed a lack of credit programs and curricula for training individuals in the technical aspects of hazardous materials management and need for hazardous materials technicians by local industry. In response, an associate of applied science (AAS) degree program in Hazardous Materials Technology was developed using the Developing a Curriculum process. The curriculum, which was designed to address nine areas of competence and 107 specific tasks, includes 11 competency-based courses: Hazardous Materials Regulations I, II, and III; Industrial Processes; Hazard Communication Standard; Sampling and Analysis; Emergency Response I and II; Hazardous Materials Recovery, Incineration, and Disposal; Hazardous Materials Health Effects; and Advanced Hazardous Materials Analysis. The 11 courses are the foundations of the 2-year AAS program as well as an 18 credit hour certificate. The AAS program prepares individuals for entry-level jobs that provide technical support for managing hazardous materials. The certificate program was designed as a fast track for full-time employed students who already have an industrial background with hazardous materials. The implementation of the program required minor facility improvements, expansion of library resources, and course scheduling to accommodate working students. As of March 1989, 73 institutions and representatives from Canada, Puerto Rico, Saudi Arabia, Mexico, and Australia have expressed interest in the curriculum. Expansion and articulation of the program are planned. (AYC)

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HAZARDOUS MATERIALS TECHNOLOGY: A COMMUNITY COLLEGE'S RESPONSE TO A CRITICAL EMPLOYMENT NEED

Authors:
Janice N. Friedel, Ph.D.
Associate Vice Chancellor for Academic Affairs and Planning
Eastern Iowa Community College District

David A. Claeys, Ed.D.
Director of Hazardous Materials Programs
Eastern Iowa Community College District, and
Dean of Academic Affairs, Scott Community College

Dennis D. Graham, M.A.
Department Coordinator
Department of Environmental and Laboratory Technologies
Eastern Iowa Community College District

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HAZARDOUS MATERIALS TECHNOLOGY
A COMMUNITY COLLEGE'S RESPONSE TO A CRITICAL EMPLOYMENT NEED

Authors: Janice N. Friedel, Ph.D., David L. Claeys, Ed.D.,
and Dennis D. Graham

INTRODUCTION

Protection of human health and the environment is one of the most critical problems facing this country and the world today. Almost daily, environmental horror stories are reported in the news regarding how the mismanagement of hazardous materials and wastes have damaged our land, water, and air and threatened the lives of workers and citizens.

Of the 66,000 chemicals used today in industry and manufacturing, 60,000 are classified as hazardous. Over 200,000 businesses are regulated as generators of these hazardous materials; more than 3.7 million workers are exposed to high concentrations of the chemicals. In response to these problems, regulatory agencies are increasing their site visits to companies to ensure compliance, and state and federal legislatures are passing laws to further regulate hazardous materials.

Companies struggle to be knowledgeable regarding current legislation and compliance standards. The 1976 Resource Conservation and Recovery Act (RCRA) was passed to protect against the improper disposal of hazardous wastes. Companies generating more than 1,000 kilograms of hazardous wastes per month were considered large generators and were required to comply. The Hazardous and Solid Waste Amendments of 1984 mandated a radical change in the number of facilities that must comply with hazardous waste handling laws (RCRA). These

amendments require compliance of any company that produces more than 100 kilograms of hazardous waste per month; thus, the number of federally regulated operators of hazardous materials increased from approximately 15,000 to more than 200,000.

Recent legislation has not only expanded the number of facilities that must properly handle and dispose of hazardous materials, but has provided regulations that protect the public from potential hazards of chemicals. The Occupational Health and Safety Administration's (OSHA) Hazard Communications Standards requires employers to inform employees of potential chemical hazards. The Superfund Amendment and Reauthorization Act of 1986 (SARA) was intended to provide protection for employees and the public from hazardous materials found not only in the workplace, but in the community as well.

Additionally, a large number of toxic materials are regulated by the EPA through such laws as: The Toxic Substances Control Act; Federal Insecticide, Fungicide, and Rodenticide Act; Federal Food, Drug and Cosmetic Act; Comprehensive Environmental Response, Compensation and Liability Act; Clean Air Act; Safe Drinking Water Act; Marine Protection Research and Sanctuaries Act; Asbestos School Hazard Act; Asbestos Hazard Emergency Response Act; and, Emergency Planning and Community Right-to-Know Act.

The Critical Need is Identified

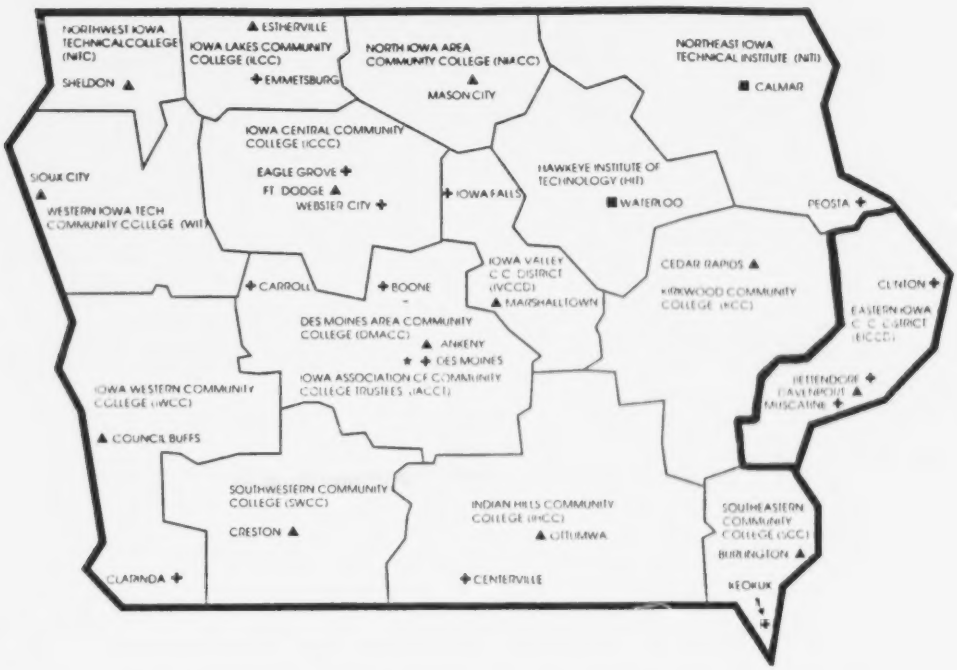
Increasing public and proprietary understanding of these environmental laws is critical to our success in solving global environmental problems. Understanding and communicating the complexities of these laws requires an extensively trained workforce. The need for a well-trained workforce, both in the agencies that must do the regulating and the regulated community, is well

documented. A needs assessment by Ulster County Community College showed an "industry-wide" 6.5% increase in the total workforce needed to meet the increased demand for trained workers in the field of hazardous materials. (Ulster Community College, 1984). It estimated that by 1990, over 300,000 Hazardous Materials Technicians will be needed to ensure industrial compliance with federal and state legislation (Helms, 1983). Additionally, the U.S. Office of Technology Assessment has predicted a 207% increase in the total number of people with Superfund-related skills needed by the EPA from 1980-1990 (Office of Technology Assessment, 1986).

The Eastern Iowa Community College District

The Eastern Iowa Community College District (EICCD) is located in East Central Iowa, and serves the counties of: Scott, Clinton, Jackson, Muscatine and parts of Cedar and Louisa (Figure 1). The EICCD is comprised of three colleges: Muscatine Community College, Clinton Community College, and Scott Community College. These three colleges are nestled along the banks of the Mississippi River, a heavily industrialized area of the Midwest. The need for these local industries to meet federal and state compliance requirements resulted in the EICCD's commitment to develop a program to address the treatment, handling, and disposal of hazardous materials.

Figure 1



The Eastern Iowa Community College District

Needs Assessment Conducted

An investigation by the EICCD in early 1986 indicated a lack of credit programs and curriculum for training individuals in the technical aspects of managing hazardous materials. As Pat Powers, Director for the EPA's National Workforce Development Staff, has stated, "There has been no way for people entering the field to advance. The need for Hazardous Materials Technicians is becoming critical in the wake of amendments to federal regulations that increase more than tenfold the number of regulated hazardous materials generators."

Persuaded by requests from the local Private Industry Council (PIC) and other industries, the EICCD formed a Hazardous Materials Program Advisory

Council. This Council was comprised of area employers, coordinators of county emergency response teams, and representatives from state and regulatory agencies.

With assistance from the Advisory Council, a survey was designed and conducted to assess the need for hazardous materials technicians, and the education and skills required of the technicians (Appendix A). The results of this assessment supported the development and implementation of an Associate of Applied Science (AAS) degree program in Hazardous Materials Technology. Based on the survey results, the Advisory Council also identified general competencies that are needed by Hazardous Materials Technicians. It was obvious that extensive curriculum development and equipment purchases would be needed for the offering of the 2-year program. External sources of funding were pursued.

External Support for Program Development and Implementation

In the spring, 1986, the EICCD received a $202,000 grant from the U.S. EPA to develop a competency-based AAS degree program to train hazardous materials technicians. The curriculum would be designed to serve as a national model for training individuals for hazardous materials technology careers in the public and private sectors. These individuals would manage hazardous materials and wastes in compliance with regulations to protect human health and the environment, as well as to minimize an organization's risk.

The implementation of the Hazardous Materials Technology program at the three colleges of the EICCD was further facilitated through the award of a $150,000 grant from the Iowa Department of Education for the purchase of equipment and the delivery of instruction. The EICCD also received funds from

the Iowa Department of Economic Development for the purchase of other additional equipment.

Local industries and emergency response agencies also provided assistance in the implementation of the program by making various facilities and equipment available for instructional and demonstration purposes.

In the first year of its operation, 106 students enrolled in the program. One hundred twenty-six students enrolled in its second year of offering. Both a Certificate and an AAS degree are obtainable. The salaries of graduates from the program have ranged from $26,000 to $42,000/year.

This article briefly describes the competency-based Hazardous Materials Technician program developed and utilized by the EICCD, and the strategies undertaken to ensure the program's continued success.

THE PROGRAM: ITS DEVELOPMENT AND CURRICULUM

Development of the Program

In January, 1986, a team of local and national experts assisted the EICCD in the definition and validation of competencies for Hazardous Materials Technicians. Using the DACUM (Developing A Curriculum) process, a two-day workshop was held in which these experts identified the tasks that a successful worker performs as a Hazardous Materials Technician. Nine general areas of competence were identified:

1. Interpreting regulations
2. Developing procedures and plans
3. Managing hazardous materials
4. Training employees
5. Sampling and handling hazardous materials

6. Contracting services
7. Coordinating emergency response
8. Auditing hazardous materials compliance
9. Continuing education

These general areas of competence provided the basis for the definition of a Hazardous Materials Technician: a technician that provides technical support on handling hazardous materials for a company or agency. This support includes preparing permit applications, interpreting regulations for applicability, monitoring control equipment, acting as a liaison with regulatory agency personnel, responding to a chemical emergency, implementing worker "right-to-know" training, and maintaining good relations with industrial community neighbors.

Each of the nine general areas was further defined with specific tasks, resulting in 107 specific performance tasks. The competencies and tasks were further defined and validated by responses obtained from a survey sent to over 300 companies and agencies (Appendix B). Its national distribution guaranteed that the competencies defined by the DACUM Panel were representative of this emerging occupational field. These general areas of competence and the specific tasks are detailed on the DACUM Chart given in Figure 2.

The DACUM Chart can be used as a basis for:

1. Curriculum development
2. The assessment of student learning
3. Training needs assessments
4. Worker performance evaluations
5. Competency-based test development.

Specific Tasks

General Areas of Competence

A. INTERPRETING REGULATIONS	A-1 Consider organization product line and constraint	A-2 Determine applicability of regulations (ie local, state, federal)	A-3 Identify resources and references	A-4 Discuss with regulators varying interpretations	A-5 Recommend compliance methods/strategy
	A-6 Carry out applicable standards (ie OSHA DOT, EPA)	A-7 Respond to inquiries and requests	A-8 Provide input to legislators about new or proposed regulations	A-9 Maintain current files	
B. DEVELOPING PROCEDURES AND PLANS	B-1 Classify materials	B-2 Interpret Material Safety Data Sheet	B-3 Describe Goals	B-4 Consider audience (primarily users)	B-5 Ensure regulatory compliance
	B-6 Consider organization's product line and constraints	B-7 Consider alternative methods and costs	B-8 Incorporate environmental safety program and guidelines	B-9 Define responsibilities	B-10 Provide information for prevention planning
	B-11 Design distribution of plan	B-12 Distribute handling procedures	B-13 Develop forms/records	B-14 Provide for and revise updates	B-15 Maintain records
C. MANAGING HAZARDOUS MATERIALS	C-1 Ensure regulatory compliance	C-2 Obtain permits	C-3 Monitor inventory control	C-4 Assess environmental conditions	C-5 Control proper usage
	C-6 Control proper storage of hazardous material	C-7 Control transportation of hazardous materials (manifests and permits)	C-8 Control disposal of hazardous materials	C-9 Monitor employees handling of hazardous materials	C-10 Conduct fact finding studies
	C-11 Evaluate and recommend alternatives (ie methods & mat)	C-12 Maintain records			
D. TRAINING EMPLOYEES	D-1 Ensure regulatory compliance	D-2 Define training needs	D-3 Determine participants	D-4 Outline or organize curriculum	D-5 Determine costs
	D-6 Develop realistic schedule (eg frequency)	D-7 Assemble/acquire training materials (ie hire consultants)	D-8 Conduct training program	D-9 Evaluate training activities	D-10 Maintain records
E. SAMPLING AND HANDLING HAZARDOUS MATERIALS	E-1 Ensure regulatory compliance	E-2 Identify the material	E-3 Follow organization's policies	E-4 Identify, select and use safety equipment	E-5 Collect sample
	E-6 Package the sample for shipping	E-7 Identify and assess lab services	E-8 Analyze sample	E-9 Interpret analytical data	E-10 Disseminate information
	E-11 Coordinate information with outside agencies (eg vendors for disposal)	E-12 Maintain records			
F. CONTRACTING SERVICES	F-1 Define scope of work/needs	F-2 Write specifications	F-3 Consult with legal staff	F-4 Consult with purchasing department	F-5 Provide cost justifications
	F-6 Research qualified contractors/ vendors for services & products	F-7 Conduct on-site visits	F-8 Secure bids	F-9 Obtain permits	F-10 Train contractors
	F-11 Evaluate and verify vendor's performance	F-12 Maintain records			
G. COORDINATING EMERGENCY RESPONSE	G-1 Gather information about incident	G-2 Assess the extent of the situation	G-3 Implement response plan	G-4 Determine reporting requirements	G-5 Ensure regulatory compliance
	G-6 Report incident (eg spills)	G-7 Designate authority	G-8 Provide advise to emergency response crews	G-9 Direct use of emergency equipment	G-10 Supervise clean-up
	G-11 Provide public relations information	G-12 Verify completion	G-13 Critique the situation	G-14 Maintain records	
H. AUDITING HAZARDOUS MATERIALS COMPLIANCE	H-1 Follow organization's policies and procedures	H-2 Create master file (eg data base for record mgt)	H-3 Create/follow audit schedule	H-4 Audit records	H-5 Interview personnel
	H-6 Inventory Materials	H-7 Assess environmental conditions (eg on-site visits)	H-8 Report results (ie. violations and compliance)	H-9 Propose corrective action	H-10 Verify follow-up activities
	H-11 Maintain confidentiality	H-12 Control dissemination of report findings	H-13 Critique the audit process (ie. be open to feedback)	H-14 Conduct cost benefit analysis	H-15 Maintain records
I. CONTINUING EDUCATION	I-1 Read current publications	I-2 Attend Seminars	I-3 Maintain communication with peer groups	I-4 Provide training sessions	I-5 Participate in professional associations
	I-6 Participate in community relations activities	I-7 Acquire and maintain certification	I-8 Write technical papers and articles		

Figure 2
DACUM Chart
Hazardous Materials Technician

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HAZARDOUS MATERIALS TECHNICAL COORDINATOR

The Hazardous Materials Technical Coordinator manages hazardous materials and wastes in compliance with regulations to protect human health and the environment as well as to minimize an organization's risks.

PANEL MEMBERS

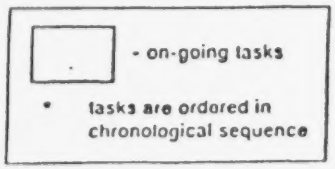
Neil E. Richars, President,
Richars and Assoc., Morton, Ill
Jennie M. Richardson, Production Manager,
Uticore Technologies, Bettendorf, Ia
Roger Dell, Group Leader Wet Chemistry,
Chemical Waste Management, Riverdale, Ill
Jeffrey S. Bisvee, Engineer-Environmental Coordinator,
John Deere Davenport Works, Davenport, IA
James C. Fowler, Engineering Specialist,
Monsanto Agricultural Company, Muscatine, IA
Paul Crosser, Manufacturing Research Engineer,
Hon INdustries, Muscatine, IA
Leonard E. Curry, Executive Vice President,
Curry Environmental Services, Rock Island, Il
Stever M. Johnson, Environmental Coordinator,
Iowa-Illinois Gas and Electric Company, Davenport, IA
Marshall K. Sonksen, Staff Environmental Engineer,
Aluminum COmpany of America, Davenport, Ia
Gene L. Tranel, Hazardous Materials COordinator,
Caterpillar, Inc, Davenport, IA

FACILITATOR:
Timothy D. Nolan, DACUM Coordinator-Facilitator,
ACCTion Consortium, Tri-County Technical College, Pendleton, S.C.

RECORDER:
Cindy Lake, Instructional Designer,
Hazardous Materials Program, Scott Community; College, Bettendorf, IA

SPONSOR:
Dennis Graham, Hazardous Materials Project Director
Eastern Iowa Community College District, Davenport, IA

January 29 & 30, 1987



Using the DACUM chart and the results from the competency-validation survey as skeletal guides, the content of 11 competency-based courses was determined. (Figure 3). A college expert in the Hazardous Materials field, assisted by external consultants and the local Advisory Council, structured the instruction of these competencies and pertinent content into 11 courses. Practitioners and content experts provided consultative assistance in the development of the courses. Content validity was ensured through "expert" review of the materials.

Figure 3

Hazardous Materials Courses

Hazardous Materials Regulations I	3 credit hours
Industrial Processes	3 credit hours
Hazard Communication Standard	3 credit hours
Sampling and Analysis	5 credit hours
Hazardous Materials Regulations II	3 credit hours
Emergency Response I	3 credit hours
Hazardous Materials Recovery, Incineration, and Disposal	3 credit hours
Hazardous Materials Regulations III	3 credit hours
Emergency Response II	3 credit hours
Hazardous Materials Health Effects	4 credit hours
Advanced Hazardous Materials Analysis	5 credit hours

Each course is divided into modules, and each module has separate goals and objectives, as well as pre-tests and post-tests. For instance, the goal of Industrial Processes is to enable the student "to serve confidently in any

industrial situation by supplying decisionmakers (plant engineers, plant managers, legal staff, industrial engineers, etc.) with adequate and accurate technical information and recommendations to enable them to: 1) guide the facility to compliance with all hazardous materials and waste regulations; 2) protect work and community health and safety; and 3) reduce company costs by recommending product substitution, better handling, and minimized waste generation." The course is divided into five modules:

Module 1: Introduction to Principles of Flow of Materials

Module 2: Regulatory Agenda Overview

Module 3: Electroplating, Metal Finishing, and Printed Circuit Board Production

Module 4: Oil Refining and Chemical Production

Module 5: Steel Production

The course design format allows module topics to be used individually or recombined for short-term instruction. For instance, Module 4 of Emergency Response I covers the specifics of the Superfund Amendment Reauthorization Act and can be used for a non-credit course.

Program Design

The eleven Hazardous Materials courses are the foundation of the flexible exit-point program. A 2-year AAS degree is available as well as an 18-semester hour credit Certificate. The eleven courses were combined with General Education courses and foundation Sciences courses to form the AAS degree program (64 credits). This program prepares individuals for entry-level jobs that provide technical support on managing hazardous materials for an organization or agency. Students entering this program are recommended to have 10th grade reading and writing levels, and to have completed one year of high

school Algebra. As Figure 4 indicates, the first semester contains General Education courses and Science courses, with courses dealing specifically with Hazardous Materials occurring in the second, third, and fourth terms.

Figure 4

Hazardous Materials Technician Program
AAS Degree

		Semester Hours Credit
First Semester		
ENGL:105	English Composition I	3
MATH:130	Intermediate Algebra	3
CHEM:110	Basic Chemistry	4
BIOL:160	Human Anatomy & Physiology I	4
or		
BIOL:161	Anatomy & Physiology I	
SPEE:105	Principles of Speech	2
		16
Second Semester		
CHEM:115	Basic Organic Bio-Chem	4
SCI:105	Man & His Environment	3
HMT:100	HAZMAT Regulations I	3
HMT:110	Industrial Processes	3
HMT:120	HAZCOM Standard	3
		16
Third Semester		
CHEM:260	Sampling & Analysis	5
HMT:200	HAZMAT Regulations II	3
HMT:210	Emergency Response I	3
HMT:220	HAZMAT Recovery, Incineration, and Disposal	3
	Elective	3
		17
Fourth Semester		
HMT:230	HAZMAT Regulations III	3
HMT:240	Emergency Response II	3
HMT:280	HAZMAT Health Effects	4
	Electives	6
		16

The Certificate program was designed to accommodate the educational backgrounds and work experiences of many of the full-time employed students. This 18-credit hour "fast track" program is geared specifically for those

persons who already have an industrial background and have either handled or managed hazardous materials in some capacity. As Figure 5 indicates, the Certificate program is composed of six courses, and "ladders" to the AAS degree. It is recommended that students have at least a 10th grade proficiency in reading and writing.

Figure 5

Hazardous Materials Technician
Certificate Program

HMT:110	HAZMAT Regulations I	3
HMT:120	HAZCOM Standard	3
HMT:200	HAZMAT Regulations II	3
HMT:210	Emergency Response I	3
HMT:230	HAZMAT Regulations III	3
HMT:240	Emergency Response II	3
		18

Facilities, Equipment, and Materials.

Implementation of the program in the EICCD required minor facility improvement, i.e. an upgrading of the ventilation system in the chemistry laboratories. In addition to the standard equipment found in the typical community college chemistry laboratory, equipment was purchased principally to support the Sampling and Analysis and Emergency Response I and II courses. The list of equipment both purchased by the EICCD and donated by businesses and agencies to the program are given in Appendix C.

Reference materials were purchased, as well as subscriptions to periodicals pertinent to the field of Hazardous Materials Management. These materials were deemed essential by the Program Developers and faculty for student reference in curriculum updating. A list of these library resource materials is given in Appendix D.

Program Implementation

To accommodate the full-time employed students, the EICCD schedules course offerings in the evenings. Weekend "hands-on" training activities have also been instituted for student convenience and site availability. Many of the training activities are assisted by the local Fire Department, County Disaster Services, and the County HAZMAT Team.

Enrollment for the first year totalled 126 students: 61 students were pursuing the AAS degree, and 65 students were majoring in the Certificate program. Many students who completed the Certificate returned to pursue the AAS degree. Student and instructor response through course evaluations has been extremely favorable. Course evaluations have also been conducted by experts in the field who have critiqued the content in the Instructor Manuals.

Availability of Curriculum

Revisions of the courses are an ongoing process so that the curriculum will continue to reflect the current rules and regulations. The quality of the written curriculum, the success of the program's implementation, and the increased demand for trained technicians were the themes of a national conference sponsored by the EICCD in August, 1988. The conference attendance represented over 50 colleges and universities from 23 states, Canada and Puerto Rico. Government and education leaders from the Arab Urban Development Institute (Saudi Arabia), Mexico, and Australia have also requested information regarding this curriculum and its adaptability to their countries. These nations are also interested in students from their countries enrolling and completing the program at the EICCD.

The competency-based courses (both student and teacher texts) are available for adoption by other community and technical colleges. As of March, 1989, seventy-three institutions have requested demonstration copies of the Hazardous Materials Technician Instructional texts for evaluation and reference. Institutions interested in examining the curriculum should contact the Eastern Iowa Community College District.

Future Direction

The EICCD will continue to expand its offerings related to the Environmental Sciences. The EICCD has recently received state approval to implement a Chemical Laboratory Technician program. The District is currently working with area high schools in the development of a 2+2 Hazardous Materials Technology program. These high school articulation efforts are supported by a grant funded by the U.S. Environmental Protection Agency. A primary objective of the project is to increase the awareness and understanding of high school students regarding environmental health and safety, and to demonstrate to them the many career opportunities in this field.

Efforts are also underway to articulate the existing community college program to senior colleges. The EICCD is expanding its non-credit offerings by using modules from the credit curricula, and developing new short-term programs such as Asbestos Worker. The EICCD will also host another national conference related to the Hazardous Materials Technology program, and plans to conduct teacher training and update conferences.

The Hazardous Materials Technician program has proven to be a successful and innovative program for the EICCD. Individuals interested in learning more about its development, reviewing the curriculum or attending the conferences

and updates cited above should contact Dr. Jan Friedel, Associate Vice Chancellor for Academic Affairs and Planning, Eastern Iowa Community College District, 306 West River Drive, Davenport, IA 52801, (319) 322-5015, or Dr. David Claeys, Director of Hazardous Materials Programs and Dean of Scott Community College, 500 Belmont Road, Bettendorf, IA 52722, (319) 359-7531.

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APPENDIX A

Hazardous Materials Technology Survey

CLINTON COMMUNITY COLLEGE
SCOTT COMMUNITY COLLEGE
MUSCATINE COMMUNITY COLLEGE

EASTERN IOWA COMMUNITY COLLEGE DISTRICT

DISTRICT OFFICE OF ACADEMIC AFFAIRS AND PLANNING
Scott Community College • 500 Belmont Road • Bettendorf, Iowa 52722-5649 • (319) 359-7531

HAZARDOUS MATERIALS TECHNOLOGY SURVEY

NOTE: For the purpose of the survey, a hazardous materials technician is defined as one who manages hazardous materials and wastes in compliance with regulations to protect human health and the environment as well as to minimize an organization's risks.

The purpose of this survey is to assist the Eastern Iowa Community College District in gathering information about employment trends and educational needs in the hazardous materials technology field. Your responses will help to determine if there is a need for a hazardous materials technician program. The names of firms and businesses replying will not be released. We appreciate the time you will take to complete this survey.

DIRECTIONS: Please indicate your response by circling the number corresponding to your choice or by providing the information requested.

SECTION A

---

1. Which of the following best describes the nature of your business?

1. Apparel and other textile products
2. Chemicals and allied products
3. Electrical equipment and supplies
4. Fabricated metal products
5. Food and kindred products
6. Furniture and fixtures
7. Instruments and related products
8. Leather and leather products
9. Lumber and wood products
10. Machinery, except electrical
11. Miscellaneous manufacturing products
12. Paper and allied products
13. Petroleum and coal products
14. Primary metal industries
15. Printing and publishing
16. Rubber and plastic products
17. Stone, clay and glass products
18. Textile mill products
19. Tobacco manufacturers
20. Transportation equipment
21. Other: (Please specify) _____

SECTION A (Cont'd)

2. What is the total number of employees at your facility?

   1. 1-25
   2. 26-49
   3. 50-99
   4. 100-249
   5. 250-500
   6. More than 500

3. The following is a list of general tasks which enable a business to manage their hazardous materials and wastes. Which of these tasks apply to your facility? (Circle all that apply.)

   1. Determine applicability of hazardous materials regulations based on products used/stored/manufactured at your facility.

   2. Develop/write proper handling procedures for hazardous materials.

   3. Recommend/develop programs to ensure compliance of regulations.

   4. Manage hazardous materials which includes: controlling proper usage, storage, transportation, and disposal of hazardous materials.

   5. Develop and implement training programs to train employees on the proper handling of hazardous materials (i.e. "Right-to-Know training").

   6. Collect and analyze samples to determine potential hazards in the workplace.

   7. Select qualified contractors/vendors for services and products which assist in hazardous materials management.

   8. Coordinate emergency response efforts which includes: recommending response actions for protecting human health and the environment, and for the containment, clean-up, and disposal of materials.

4. Do you have one or more persons at your facility assigned to perform the above listed tasks?

   1. Yes
   2. No → Would your company hire someone to manage hazardous materials at your facility?

      1. Yes
      2. No
      3. Uncertain

If you answered "No" to question 4, please skip SECTION B and continue on to SECTION C.

SECTION B If you answered "No" to question 4, please skip SECTION B and continue on to SECTION C.

5. What is the minimum educational level required to manage hazardous materials at your facility?

   1. High school
   2. Post-secondary attendance
   3. Associate degree
   4. Bachelor's degree
   5. Other (Please specify)_____

6. What types of training/updating do you provide for your personnel who manage hazardous materials. (Circle all that apply.)

   1. On-the-job training/updating
   2. In-house training seminars
   3. External training seminars
   4. Community college courses
   5. University/4-year college courses
   6. Professional association workshop classes
   7. No training/updating
   8. Other (please specify)_____

   _____

7. What is the average expected entry-level salary for personnel managing hazardous materials at your facility?

   1. Less than $13,000 per year
   2. $13,000-$14,999 per year
   3. $15,000-$16,999 per year
   4. $17,000-$18,999 per year
   5. $19,000-$20,999 per year
   6. $21,000 and up

8. Are there any hazardous materials jobs now being done by advanced-degreed people (BA, BS +) that could be done by an adequately trained (2-year) technician?

   1. Yes
   2. No
   3. Uncertain

   → Please list the jobs/tasks which could be done by a technician.

   _____

   _____

   _____

   _____

SECTION C

9. Do you feel there is a need in the local area for specialized courses in hazardous materials technology?

   1. Tremendous need
   2. Moderate need
   3. Small need
   4. No need

10. Would your company hire a hazardous materials technician who graduated from a 2-year post-secondary training program?

    1. Yes
    2. No
    3. Uncertain

11. Would your company send their employees to a community college for hazardous materials training?

    1. Yes
    2. No
    3. Uncertain

12. What specific courses/seminars/workshops etc. do you feel should be taught to meet your future training/education needs?

APPENDIX B

Hazardous Materials Technician

Competency Validation Survey

EASTERN IOWA COMMUNITY COLLEGE DISTRICT

HAZARDOUS MATERIALS TECHNICIAN SURVEY

The purpose of this survey is to assist the Eastern Iowa Community College District in gathering information about employment trends and educational needs in the hazardous materials technician field. Your responses will help provide direction to our future programming efforts. The names of firms and businesses replying will not be released. We appreciate the time you will take to complete this survey.

DIRECTIONS:

For each of the following skills listed, please indicate if it is a required task of entry level hazardous materials technicians, by circling YES or NO. ALso indicate how important that skill is to a new employee by circling the correct degree of importance.

Entry Level
1. Yes
2. No

Order of Importance to New Employee
1. Extremely Important
2. Very Important
3. Important
4. Some Importance
5. Not Important
6. Not Used

I										
	INTERPRETING REGULATIONS									
1-2	1. Consider organization product line and contracts.	Yes	No	1	2	3	4	5	6	
3-4	2. Determine applicability of regulations (local, state, federal).	Yes	No	1	2	3	4	5	6	
5-6	3. Identify resources and references.	Yes	No	1	2	3	4	5	6	
7-8	4. Discuss with regulators varying interpretations.	Yes	No	1	2	3	4	5	6	
9-10	5. Recommend compliance methods/strategies.	Yes	No	1	2	3	4	5	6	
11-12	6. Carry out applicable standards (DOT, OSHA, EPA, etc.)	Yes	No	1	2	3	4	5	6	
13-14	7. Respond to inquiries and requests.	Yes	No	1	2	3	4	5	6	
15-16	8. Provide input to legislators about new or proposed regulations.	Yes	No	1	2	3	4	5	6	
17-18	9. Maintain current files.	Yes	No	1	2	3	4	5	6	
	DEVELOPING PROCEDURES AND PLANS									
19-20	1. Classify materials.	Yes	No	1	2	3	4	5	6	
21-22	2. Interpret MSDS.	Yes	No	1	2	3	4	5	6	
23-24	3. Describe goals.	Yes	No	1	2	3	4	5	6	
25-26	4. Consider audience (primarily users).	Yes	No	1	2	3	4	5	6	
27-28	5. Ensure regulatory compliance.	Yes	No	1	2	3	4	5	6	

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29-30	6.	Consider organizations product line and constraints.	Yes	No	1	2	3	4	5	6
31-32	7.	Consider alternative methods and costs.	Yes	No	1	2	3	4	5	6
33-34	8.	Incorporate environmental and safety program guidelines.	Yes	No	1	2	3	4	5	6
35-36	9.	Define responsibilities.	Yes	No	1	2	3	4	5	6
37-38	10.	Provide information for prevention planning.	Yes	No	1	2	3	4	5	6
39-40	11.	Design distribution of plan.	Yes	No	1	2	3	4	5	6
41-42	12.	Distribute handling procedures.	Yes	No	1	2	3	4	5	6
43-44	13.	Develop forms/records.	Yes	No	1	2	3	4	5	6
45-46	14.	Provide and revise updates.	Yes	No	1	2	3	4	5	6
47-48	15.	Maintain records.	Yes	No	1	2	3	4	5	6
		MANAGING HAZARDOUS MATERIALS								
49-50	1.	Ensure regulatory compliance.	Yes	No	1	2	3	4	5	6
51-52	2.	Obtain permits.	Yes	No	1	2	3	4	5	6
53-54	3.	Monitor inventory control.	Yes	No	1	2	3	4	5	6
55-56	4.	Access environmental conditions.	Yes	No	1	2	3	4	5	6
57-58	5.	Control proper usage.	Yes	No	1	2	3	4	5	6
59-60	6.	Control proper storage of hazardous materials.	Yes	No	1	2	3	4	5	6
61-62	7.	Control transportation of hazardous materials (ie: manifests/permits).	Yes	No	1	2	3	4	5	6
63-64	8.	Control disposal of hazardous materials.	Yes	No	1	2	3	4	5	6
65-66	9.	Monitor employees handling of hazardous materials.	Yes	No	1	2	3	4	5	6
67-68	10.	Conduct fact finding studies.	Yes	No	1	2	3	4	5	6
69-70	11.	Evaluate recommend alternatives (methods/materials).	Yes	No	1	2	3	4	5	6
71-72	12.	Maintain records.	Yes	No	1	2	3	4	5	6
II		TRAINING EMPLOYEES								
1-2	1.	Ensure regulatory compliance.	Yes	No	1	2	3	4	5	6
3-4	2.	Define training needs.	Yes	No	1	2	3	4	5	6
5-6	3.	Determine participants.	Yes	No	1	2	3	4	5	6
7-8	4.	Outline or organize curriculum.	Yes	No	1	2	3	4	5	6
9-10	5.	Determine costs.	Yes	No	1	2	3	4	5	6
11-12	6.	Develop realistic schedules (frequency).	Yes	No	1	2	3	4	5	6
13-14	7.	Assemble/acquire training materials (hire consultants).	Yes	No	1	2	3	4	5	6
15-16	8.	Conduct training program.	Yes	No	1	2	3	4	5	6
17-18	9.	Evaluate training activities.	Yes	No	1	2	3	4	5	6
19-20	10.	Maintain records.	Yes	No	1	2	3	4	5	6

	SAMPLING AND HANDLING HAZARDOUS MATERIALS									
21-22	1. Ensure regulatory compliance.	Yes	No	1	2	3	4	5	6	
23-24	2. Identify the material.	Yes	No	1	2	3	4	5	6	
25-26	3. Follow organization's policies.	Yes	No	1	2	3	4	5	6	
27-28	4. Identify, select and use safety equipment.	Yes	No	1	2	3	4	5	6	
29-30	5. Collect sample.	Yes	No	1	2	3	4	5	6	
31-32	6. Package sample for shipping.	Yes	No	1	2	3	4	5	6	
33-34	7. Identify and assess lab services.	Yes	No	1	2	3	4	5	6	
35-36	8. Analyze sample.	Yes	No	1	2	3	4	5	6	
37-38	9. Interpret analytical data.	Yes	No	1	2	3	4	5	6	
39-40	10. Disseminate information.	Yes	No	1	2	3	4	5	6	
41-42	11. Coordinate information with outside agencies (eg: vendors for disposal)	Yes	No	1	2	3	4	5	6	
43-44	12. Maintain records.	Yes	No	1	2	3	4	5	6	
	CONTRACTING SERVICES									
45-46	1. Define scope of work/needs.	Yes	No	1	2	3	4	5	6	
47-48	2. Write specifications.	Yes	No	1	2	3	4	5	6	
49-50	3. Consult with legal staff.	Yes	No	1	2	3	4	5	6	
51-52	4. Consult with purchasing department.	Yes	No	1	2	3	4	5	6	
53-54	5. Provide cost justifications.	Yes	No	1	2	3	4	5	6	
55-56	6. Research qualified contractors/vendors for services and products.	Yes	No	1	2	3	4	5	6	
57-58	7. Conduct on-site visits.	Yes	No	1	2	3	4	5	6	
59-60	8. Secure bids.	Yes	No	1	2	3	4	5	6	
61-62	9. Obtain permits.	Yes	No	1	2	3	4	5	6	
63-64	10. Train contractors.	Yes	No	1	2	3	4	5	6	
65-66	11. Evaluate/verify vendor's performance.	Yes	No	1	2	3	4	5	6	
67-68	12. Maintain records.	Yes	No	1	2	3	4	5	6	
III	**COORDINATING EMERGENCY RESPONSE**									
1-2	1. Gather information about incident.	Yes	No	1	2	3	4	5	6	
3-4	2. Assess the extent of the situation.	Yes	No	1	2	3	4	5	6	
5-6	3. Implement response plan.	Yes	No	1	2	3	4	5	6	
7-8	4. Determine reporting requirements.	Yes	No	1	2	3	4	5	6	
9-10	5. Ensure regulatory compliance.	Yes	No	1	2	3	4	5	6	
11-12	6. Report incident (eg. spills).	Yes	No	1	2	3	4	5	6	
13-14	7. Designate authority.	Yes	No	1	2	3	4	5	6	
15-16	8. Provide advise to emergency response crews.	Yes	No	1	2	3	4	5	6	

17-18	9. Direct use of emergency equipment.	Yes	No	1	2	3	4	5	6
19-20	10. Supervise cleanup.	Yes	No	1	2	3	4	5	6
21-22	11. Provide public relations information.	Yes	No	1	2	3	4	5	6
23-24	12. Verify completion.	Yes	No	1	2	3	4	5	6
25-26	13. Critique the situation.	Yes	No	1	2	3	4	5	6
27-28	14. Maintain records.	Yes	No	1	2	3	4	5	6
	AUDITING HAZARDOUS MATERIALS COMPLIANCE								
29-30	1. Follow organization's policies and procedures.	Yes	No	1	2	3	4	5	6
31-32	2. Create master file.	Yes	No	1	2	3	4	5	6
33-34	3. Create/follow audit schedule.	Yes	No	1	2	3	4	5	6
35-36	4. Audit records.	Yes	No	1	2	3	4	5	6
37-38	5. Interview personnel.	Yes	No	1	2	3	4	5	6
39-40	6. Inventory materials.	Yes	No	1	2	3	4	5	6
41-42	7. Access environmental conditions (eg. on-site visits).	Yes	No	1	2	3	4	5	6
43-44	8. Report results (ie. violations and compliances).	Yes	No	1	2	3	4	5	6
45-46	9. Propose corrective action.	Yes	No	1	2	3	4	5	6
47-48	10. Verify follow-up activities.	Yes	No	1	2	3	4	5	6
49-50	11. Maintain confidentiality.	Yes	No	1	2	3	4	5	6
51-52	12. Control dissemination of report findings.	Yes	No	1	2	3	4	5	6
53-54	13. Critique for audit process (ie. be open to feedback).	Yes	No	1	2	3	4	5	6
55-56	14. Conduct cost/benefit analysis.	Yes	No	1	2	3	4	5	6
57-58	15. Maintain records.	Yes	No	1	2	3	4	5	6
IV	CONTINUING EDUCATION								
1-2	1. Read current publications.	Yes	No	1	2	3	4	5	6
3-4	2. Attend seminars.	Yes	No	1	2	3	4	5	6
5-6	3. Maintain communication with peer groups.	Yes	No	1	2	3	4	5	6
7-8	4. Provide training sessions.	Yes	No	1	2	3	4	5	6
9-10	5. Participate in professional associations.	Yes	No	1	2	3	4	5	6
11-12	6. Participate in community relations activities.	Yes	No	1	2	3	4	5	6
13-14	7. Acquire and maintain certificaiton.	Yes	No	1	2	3	4	5	6
15-16	8. Write technical papers and articles.	Yes	No	1	2	3	4	5	6

APPENDIX C

Hazardous Materials Technician

Equipment List

HAZARDOUS MATERIALS TECHNICIAN EQUIPMENT LIST
Chemical Laboratory Equipment

Equipment Item

Setaflash Flash Point Tester (closed cup)

Beta-Gamma Survey Meter

Viscosity Apparatus Sayboldt, Lab-line

Bomb Calorimeter

Pellet Press

Air Sampling Kit (for asbestos)

Portable Test Monitor for O, Combustible, HS_2CO

Sound Level Meter/Calibrator

Atomic Absorption Spectrometer Perkin Elmer Model

P-E Hydride System for Hg/As Determination

Exhaust Hood for AA and Lamps

Varian Model Gas Chromatograph with FI Detector

DIONEX Ion Chromatograph

Ion Trap Detector/Mass Spectrometer

IBM Computer PS/2 with Emulator

Corning pH/ISE Meters (4)

Sartorius Analytical Balance (2)

Sartorius Top-Loading Balance (4)

Fume Hood

Spectronic - 20 Spectrophotometer (4)

Laboratory Oven, Blue M (2)

Muffle Furnace Thermolyne 1300

Hazardous Material Kit for Detecting Hazardous Gases & Vapors

Emergency Response Equipment

SCBA 30 min/WDonning and Speak North 30 minute
SCBA, Speaking DIA, Buddy Breathing, Anti-fog
Nosecup and case

30 Min Low Press Cylinder North 30 minute spare
tank

Vinyl Chemical Suit with case
Vinyl Wheeler Chemical Suit for SCBA with case

Butyl Coated Chemical Suit

Scott air pak and 30 minute air tank

Ultralite II, Dual-Purpose Air Mask with case

Chempruf II Total-Encapsulating Suit Dual Purpose
in case

Salvage drums (overpack drums) (2)

Donated Equipment

Sorbent Pillows (2)

Pieces of Poly Prop in bag

Sorbent Booms (2)

Misc. Solvent Materials

Uvex Chemical Goggles

Kappler Top Security Suit

Netrile Chemical Gloves

PVC Chemical Gloves

Coverall - Tyvek

Poly Coated Tyvek

APPENDIX D

Hazardous Materials Technician Program
Library Resource Materials

HAZARDOUS MATERIALS TECHNICIAN PROGRAM
LIBRARY MATERIALS

Bennett, Gary F., Frank S. Feates, Ira Wilder, eds. Hazardous Materials Spill Handbook. New York: McGraw-Hill, 1982.

Bhatt, Harasiddhiprasad G., Robert M. Sykes, and Thomas L. Sweeney, eds. Management of Toxic and Hazardous Wastes. Chelsea, MI: Lewis Publishers, 1985.

Bierlein, Lawrence W. Red Book on Transportation of Hazardous Materials. Boston: Cahners Books International, 1977.

Brief, Richard S. Basic Industrial Hygiene: A Training Manual. Akron, OH: American Industrial Hygiene Association, 1975.

Burgess, William A. Recognition of Health Hazards in Industry: A Review of Materials and Processes. New York: Wiley, 1981.

Casarett, Louis J. Casarett and Doull's Toxicology: The Basic Science of Poisons, 2nd ed. Edited by John Doull, Curtis D. Klaasen, Mary O. Amdur. New York: Macmillan, 1980.

Code of Federal Regulations, Containing Codification of Documents of General Future Effect, With Ancillaries and Index, 1st ed. Washington, D.C.: Office of the Federal Register, National Archives and Record Service, 1937-1988.

Dominquez, George S., and Kenneth G. Bartlett, eds. Hazardous Waste Management. Boca Raton, FL: CRC Press, 1986.

Fawcett, Howard H. Hazardous and Toxic Materials: Safe Handling and Disposal. New York: Wiley, 1984.

Fire Protection Guide on Hazardous Materials, 9th ed. Quincy, MA: National Fire Protection Association, 1986.

Fire, Frank L. The Common Sense Approach to Hazardous Materials: A Study Guide. Tulsa, Oklahoma: Fire Engineering, Penwell Publishing Co., 1987.

Green, Michael E., and Amos Turk. Safety in Working With Chemicals. New York: Macmillan, 1978.

Harnaford, Earle S. Supervisors Guide to Human Relations, 2nd ed. Chicago, IL: National Safety Council, 1976.

Lowry, George G. Handbook of Hazard Communication and OSHA Requirements. Chelsea, MI: Lewis Publishers, 1985.

McElroy, Frank E., ed. Accident Prevention Manual for Industrial Operations: Engineering and Technology, 8th ed. (Occupational Safety and Health Series) Chicago, IL: National Safety Council, 1980.

Meidl, James H. Hazardous Materials Handbook. Beverly Hills, CA: Glencoe Press, 1972.

Michaels, Leslie, and S. S. Chissick, eds. Asbestos: Properties, Applications, and Hazards, Vols. 1 & 2. Chicester (England); New York: Wiley, 1979.

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Olishifski, Julian B., ed. Fundamentals of Industrial Hygiene, 2nd ed. Chicago, IL: National Safety Council, 1979.

Resource Conservation & Recovery Act: Inspection Manual/U. S. Environmental Protection Agency. Rockeville, MD: Government Institutes, 1982.

Robinson, J.S., ed. Hazardous Chemical Spill Cleanup. Park Ridge, NJ: Noyes Data Corp., 1979.

Sax, Newton Irving, and Richard J. Lewis, Sr. Dangerous Properties of Industrial Materials, 6th ed. New York: Van Nostrand Reinhold, 1985.

Sax, N. Irving, and Richard J. Lewis, Sr., eds. Rapid Guide to Hazardous Chemicals in the Workplace. New York: Van Nostrand Reinhold, 1985.

Teresinski, Michael F., and Paul M. Cheremisinoff. Industrial Respiratory Protection. Ann Arbor, MI: Ann Arbor Science, 1983.

Toxic and Hazardous Industrial Chemicals Safety Manual: For Handling and Disposal, With Toxicity and Hazard Date, Rev. ed. Tokyo: International Technical Information Institute, 1980.

Turner, Charles F., and Joseph F. McCreery. The Chemistry of Fire and Hazardous Materials. New York: Allyn and Bacon, 1981.

Walters, Douglas B., ed. Safe Handling of Chemical Carcinogens, Mutagens, Teratogens, and Highly Toxic Substances. Ann Arbor, MI: Ann Arbor Science Publishers, 1980.

Williams, Phillip L., and James L. Burson. Industrial Toxicology: Safety and Health Applications in the Workplace. New York: Lifetime Learning Publications, 1985.

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Environmental Management News: An International Journal for Decision-Makers and Scientists. New York, NY: Springer-Verlag.

Environmental Science and Technology. Washington, D.C.: American Chemical Society.

EPA Journal. Washington, D.C.: U. S. Environmental Protection Agency, Office of Public Affairs.

Federal Register. Washington, D.C.: U. S. Office of the Federal Register, National Archives and Record Service.

Fire Engineering. New York, NY: Technical Publishing Co., Subsidiary of Dunn & Bradstreet.

Hazardous Waste & Hazardous Materials: A Journal for Technology, Health, Environment and Policy/Hazardous Materials Control Research Institute. New York: Mary Ann Liebert, Inc.

Hazardous Substances Advisor. Neenah, WI: J. J. Keller & Associates, Inc.

Hazardous Materials/Hazardous Waste Legal Reporter. Madison, CT: Business & Legal Reports.

Hazardous Waste Management Guide. Neenah, WI: J. J. Keller & Associates, Inc.

Journal of Environmental Health. Denver, CO: National Environmental Health Association.

Journal of Hazardous Materials. Elsevier, Amsterdam, The Netherlands; New York: Elsevier Science Publishers B.V.

The Management of World Wastes, formerly Solid Wastes Management. Atlanta, GA: Communication Channels, Inc.

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